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THRIPS ATTACKING MAN.

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So many observations verging on the extraordinary and bizarre have been made of insect behavior that we no longer are surprised to learn of insects appearing out of their normal environment. It is thus with interest rather than wonder that we note a few scattered references in entomological literature to thrips, normally considered phytophagous and to some extent predaceous, attacking man in a transitory manner.

The first report of this nature is from France by Artault de Vevy¹ in 1902 who wrote that a sickman, with a tubercular fever, was attacked in bed (during August, 1901) by large numbers of *Melanotriips obesa* Fr.* The thrips appeared to attack only when the fever was at its highest—at more or less regular intervals. Chestnut trees outside the sick room seemed to be the source of the infestation. In the intervals between the fever attacks, the thrips remained on the drapes, walls, etc., in the room. Their feeding caused numerous dots on the overheated skin of the man. Other persons present, in normal health, were not attacked.

There are numerous reports in the literature of the "Massenschwärmen" of thrips and one of the earliest of these is the account by Ludwig² in 1912. During the last of July and the first of August grain-infesting species, particularly *Limothriips cerealium* Haliday, often become very numerous near Kiel and crawl on all naked parts of the body, as well as getting in the hair. These adult thrips produce an intolerable itching sensation, and in certain cases provoke an inflammation in the ears and nose.

In 1921, C. B. Williams³ described "a blood sucking thrips," (at the time unidentified) attacking Mr. F. W. Urich on May 13, 1918, in Island of Trinidad. The same specimen, on the following day when placed on the wrist of Williams "remained sucking in the same spot for over half an hour, causing a sudden sharp pain about once every minute." The blood within the thrips body gave it a pale reddish color. A small white lump about 6 mm. in diameter was raised and an area about $\frac{3}{4}$ inch by $\frac{1}{2}$ inch appeared blotched. Williams stated that "an hour after the red blotched area had gone but the smaller white raised area was still visible; after two hours only a small red mark at the point of the bite was visible."

Senevet⁴ in 1922 reported *Gynaikothriips uzeli* Zimmerman attacking man during the summer of 1920 in certain parts of Algiers. The adults often were present in such numbers as to give the appearance of a cloud. It was noted that in every place where the thrips were found, fig trees were present. The eggs, larvae, and adults were observed on the fig. leaves which were curled, twisted; and when injured badly, were dried and turned red. The adult "when lighting on the conjunctiva produces a small but very violent pain similar to an ordinary gnat.

*Probably *Melanotriips fuscus* (Sulzer). See H. Priesner. 1928. Thysanopteren Europas, pp. 92-93, Wien.

This pain subsides rather slowly." Also, when crawling on the skin "it quickly lowers its head and one feels a very sharp, lancet-like prick similar to that of a flea" bite. Senevet however suggested that these attempts to pierce the skin were possibly accidental only.

Several specimens of *Heliothrips indicus* Bagnall, a major cotton pest in the Sudan, were taken in Khartoum on October 15, 1924, biting H. B. Johnston⁵ who reported "similar cases were noted during the following few days. In some cases the 'bite,' which was sharp and painful, caused severe irritation which was followed by inflammation." A slight poisoning of the wound took place in one case. Johnston found no blood corpuscles in the digestive tract of the thrips and "suggested that possibly moisture and not blood is sought by the insect and that the irritation of the stylet may be increased by the secretion from the salivary glands."

Blunck⁶ (cited by Körting, 1930) believed that grain-infesting thrips when alighting on inhabitants of the vicinity (Northern Germany) attempted to obtain moisture by piercing exposed areas of skin.

In February, 1927, J. D. Hood⁷ found among many slides left with him by C. B. Williams, "the identical specimen to which he (Williams, 1921) refers." The species was identified as *Karnyothrips flavipes* (Jones).

In discussing the swarming of *Limothrips cerealium* Haliday, Körting (1930)⁸ wrote that these thrips crawl around on the skin from which it is believed they suck moisture, giving rise to an unpleasant itching sensation, and appear, under these conditions, to provoke an inflammation. Laborers in the grain fields in the Schleswig-Holstein district frequently suffer such molestations. Körting reported that in August, 1925, the nuisance from the swarming thrips was so great at Timmendorfer Beach (Ludbecker Bay) that many bathers abandoned the health resort.

A swarm of *Thrips imaginis* Bagnall, occurred in Melbourne, Australia, on November 15, 1931, and Evans⁹ (1932) wrote that "The thrips, which were present in huge numbers, were apparently hovering aimlessly in the air, and settling not only on flowers and leaves, but on any moist surfaces, such as hot faces and laundry on lines." Under date of August 21, 1935, Mr. Evans, in correspondence with the author, wrote:

"In my experience thrips act in this manner during periods of high temperature accompanied by low humidity (better expressed as saturation deficit), the reaction being entirely due to the fact that the insects will alight on any moist surface at these times. I have seen large open tanks of water covered with thrips that have been drowned (merely because they were drawn to the wet surface)."

"The insects do not merely rest on the wet surface but attempt, with what success I do not know, to draw up the water, and I have seen people with rashes on their faces, suggesting that they anyhow inject saliva in the punctures they make."

"I do not think this behavior is necessarily confined to any particular species. I can remember in England suffering annoyance while bicycling from thrips settling on my hands and causing irritation."

Referring to the same outbreak in Melbourne, Dr. Stanley E. Flanders of the Citrus Experiment Station, Riverside, California, wrote (July 16, 1935) to the author as follows: "The last big outbreak occurred when I was there in No-

vember, 1931. They were so numerous that the wind-shields of the cars became covered with them. Pedestrians in the main streets of Melbourne were somewhat annoyed by the thrips getting in their eyes. It was reported that bathers on the beach were covered with them."

During the past six years while engaged in studying thrips in California, the writer has had several experiences with "blood-sucking" species. It has been a common occurrence when working in experimental plots on onion thrips (*Thrips tabaci* Lind.) to feel slight pricks or "bites" on the arms, face, and neck, both when perspiring and when not. It was observed that the larvae were more prone to "bite" than the adults and in an attempt to find out more about this reaction larvae were forced to feed on the inside of the forearm by confining them inside one-half of a celluloid capsule and in some instances in a cellophane cap taped on the arm. The attempts to feed by piercing the skin produced the pricking sensation mentioned above. The first instar larvae appeared unable to pierce the skin but the larger (second instar) larvae did so and the alimentary tract took on a reddish-brown appearance after feeding. Small pinkish dots appeared on the skin which disappeared in one to two days. There was no swelling and a slight itching sensation was the only discomforture. The larvae did not live longer than about 30 hours thus confined.

The larvae of *Frankliniella moultoni* Hood were confined in a similar manner and all reactions were as recounted in the case of *T. tabaci*.

During the spring at the time when the pear thrips, *Taeniothrips inconsequens* (Uzel), is frequently present in large numbers in pear and prune orchards, growers often report feeling sharp "bites" when the adults light on exposed areas of skin, under rim of the hat, for example. The writer has had similar experiences, and, when collecting larvae of this species for laboratory studies, has noted them producing the same effect on the back of the hands, arms, face, and neck. It is quite probable that many entomologists engaged in field work with thrips have also been aware of this condition.

Attempts to force *Scolothrips sexmaculatus* (Perg.), a well-known predaceous species (both larva and adult), to feed on the arm failed. Adults and larvae of *Leptothrips mali* (Fitch), the black hunter, were confined on the arm and while extremely restless, occasionally fed at short intervals but did not produce the distinct red dots as did the larval forms previously mentioned. Similar trials with adults of *Aeolothrips fasciatus* (Linn.), *A. kuwanaii* Moulton, and larvae of *Liothrips ilex* (Moulton) have been largely unsuccessful.

Thus, commonly encountered members of both suborders of the Thysanoptera, including both plant feeding and predaceous species, when forced to feed on man have done so only intermittently in some cases, at least under the conditions described above.

In summarizing the above brief account, it must be admitted that thrips have to be placed among the *possible* vectors of insect-borne diseases (other than plant diseases*). It is conceivable that most any species of this order might suck

*Bailey, S. F. 1935. Thrips as vectors of plant disease. Journ. Econ. Ent., 28:856-863.

blood under abnormal conditions and the thickness of the dermis would doubtless greatly limit the extent to which the thrips could feed on mammals.

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*The author has not seen this reference.

FURTHER NOTES ON THE BUTTERFLIES OF SOUTHERN NEWFOUNDLAND.

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The Diurnals of southern Newfoundland were briefly commented upon last year (1935, Can. Ent. LXVII : 82). Another summer's catch by the same collector at Doyles Station has increased the number of species reported from the Island by two and possibly helped to clear up the confusion in the genus *Lycaena*. The additional species received this year are:

Incisalia augustinus Westwood, 6♂ 1♀ June 6-19

Lycaena dorcas Kirby 10♂ 2♀ Aug. 3-25

In the preceding paper (l. c. 88) reference was made to *L. epixanthe amicetus* Scudder, *L. helleoides*, Boisduval and *L. helleoides florus* Edwards as having been reported from Newfoundland. It is unlikely that more than two species are involved. The specimens received this year agree very well with specimens of *dorcas* received from Hopedale, Labrador (Lat. 55°). While no specimens of *epixanthe* have thus far been obtained there is well founded evidence of its occurrence on the Island. Specimens previously determined as *helleoides* and *florus* were probably *dorcas*. There seems to be considerable confusion in the synonymy of these names but in view of the revision of the genus by Dr. A. B. Klots, which will be published shortly, comment thereon is necessary.

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AMERICAN SPECIES OF *LUDIUS*; THE *FALLAX* AND *TRIUNDATUS* GROUPS.*

BY W. J. BROWN,

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fallax group

This group, as here defined, includes those species having the prosternal sutures excavated in which the basal margins of the propleura are truncate rather than emarginate near the posterior prothoracic angles. They are closely allied to *tessellatus* L. (*holosericeus* Oliv.) of Europe. In all of the species, and in these species only, the hairs of the elytra are variously directed in whorls or partial whorls to produce a variegated appearance. The whorling tendency is well developed and very distinct on the elytra of all species except *medianus* in which only feeble traces of it are evident. The whorling seems equally developed in all examples of each species, but the spots resulting show some variation in their distribution and size. The hairs of the pronotum are strongly whorled in *mirabilis* only; in the other species, one sees a bright spot at each angle, one at the center, and one at the middle of the pronotal base which are due to directed hairs.

In addition to the species described below, two others which are unknown to me should be considered. The Californian *Ludius elegans* Cand. (1881, Mem. Soc. Sci. Liege, IX, 97; = *candezei* Leng., 1918, Jur. N. Y. Ent. Soc. XXVI, 205) is undoubtedly a member of the group. It will be found to differ from the species known to me in having the pale elytra maculate with black at the apex. *Ludius sericeus* Gelb. (1830, Ledebe. Reis. II, 83), a species of the Altai Mountains of Asia, has been recorded from Alaska by several authors. These records may have been based on examples of the species described below as *viduus*. Schencking (1925, Junk Coleop. Cat. 80) has listed the European *tessellatus* L. as American, but this record, without doubt, is based upon *sjaelandicus* Mull. (= *tessellatus* Fab. *nec* L.).

I have found it necessary to recognize as distinct species *semiluteus* Lec. and *bombycinus* Germ. These have been considered synonymous with *fallax* Say for many years. The species described below as *viduus* has been confused with *fallax* also. In these respects, the arrangement presented here differs from that in common use. The species may be characterized as follows.

Body about three times as long as wide, depressed and only feebly convex; black, the elytra pale except in *viduus*, the antennae dark brown or black. Vestiture very distinct on both dorsum and venter; the hairs golden, very fine, closely placed, sometimes very dense on the dorsum, the hairs distinctly whorled on the elytra except in *medianus*, feebly or strongly whorled on the pronotum. Antenna short or only moderately long, moderately to strongly serrate. Head from one-half to three-fifths as wide as the pronotum, densely but not coarsely punctate; the front flat, sometimes slightly depressed. Pronotum a trifle wider than long; the sides moderately to strongly arcuate; the punctures of the disk fine and very close or dense at middle, not coarser and scarcely more dense on the sides, not confluent; the posterior angles short, not very acute except in *mirabilis*, distinctly carinate. Elytra subparallel, not widened apically; the striae fine, distinctly impressed, finely

*Contribution from the Division of Systematic Entomology, Entomological Branch, Department of Agriculture, Ottawa.

punctate; the intervals feebly convex, very finely and closely but not very distinctly punctulate. Prosternal sutures excavated anteriorly. Posterior margin of propleuron straight and not emarginate near the posterior prothoracic angle. Prosternum, mesternum and abdomen finely, very closely punctate, the punctures not coarser and scarcely closer on the sides; propleura a little less finely, confluent punctate. Females usually slightly larger and more robust than males and with the antennae shorter.

KEY TO SPECIES

1. Intermediate antennal segments as wide as long; pronotal sides strongly sinuate at the base of the posterior angles, the angles strongly divergent and very acute. Head and pronotum almost concealed by the vestiture which is conspicuously whorled on the pronotum 6. *mirabilis* Fall.
- Intermediate antennal segments distinctly longer than wide; pronotal sides feebly sinuate at the base of the posterior angles; the latter not or scarcely divergent, broad and not very acute. Head and pronotum not concealed by the vestiture which is very feebly whorled on the pronotum 2.
2. Elytra very dark brown or blackish 4. *viduus* n. sp.
- Elytra pale reddish-brown or brownish-yellow 3.
3. Vestiture of elytra not or very indistinctly whorled; eastern
..... 1. *medianus* Germ.
Vestiture of elytra distinctly whorled 4.
4. Third antennal segment equal in length to and at least three-fourths as wide as the fourth 5. *semiluteus* Lec.
Third antennal segment slightly shorter than the fourth 5.
5. Third antennal segment more strongly triangular, seven-tenths as wide as long; eastern 3. *fallax* Say
Third antennal segment less strongly triangular, six-tenths as wide as long; western 2. *bombycinus* Germ.

1. *Ludius medianus* Germ.

Diacanthus medianus Germ., 1843, Zeit. fur Ent. IV, 71.

Corymbites rubidipennis Lec., 1853, Trans. Am. Philos. Soc. X, 437.

Length 8.8-10.7 mm.; width 3-3.8 mm. Elytra and legs dull, pale brownish-yellow. Male antenna surpassing the apex of the posterior pronotal angle by a distance equal to one-third the length of the apical segment, moderately serrate; the second segment four-fifths as wide as long, three-fourths as long as and equal in width to the third; the third segment scarcely triangular, three-fifths as wide as long, seven-tenths as long as and three-fifths as wide as the fourth; the fourth segment six- or seven-tenths as wide as long; the intermediate segments distinctly longer than wide; the eleventh two-fifths as wide as long, not constricted. Female antenna failing to attain the posterior angle by a distance equal to the length of one and one-half segments, the third, fourth, and intermediate segments a trifle more elongate than in the male. Pronotal sides moderately arcuate, feebly sinuate before the posterior angles; the latter scarcely divergent, stout and not very acute; the carina situated near the outer margin of the angle. Elytral vestiture showing feeble traces of a whorl just before the middle in perfect specimens. Aedeagus as figured.

The third antennal segment is smaller than in any of the other species. The present species was described from Massachusetts; *rubidipennis* Lec. was based upon specimens from Lake Superior, and the specimen bearing the name label in the Leconte collection is here designated its lectotype. The collection before me contains a large number of specimens from the following localities: Aweme and Onah, Man.; Normandale, Orillia, Biscotasing, Carp, and Go Home Bay, Ont.; Aylmer, Covey Hill, Ft. Coulonge, and Knowlton, Que.; Penobsquis, N. B.; Kentville and Portauquie, N. S.

2. *Ludius bombycinus* Germ.

Diacanthus bombycinus Germ., 1843, Zeit. fur Ent. IV, 70.

Length 10-15 mm.; width 3.4-5 mm. Elytra and legs dull, pale reddish-brown, the femora often dark brown. Male antenna failing to attain the apex of the posterior pronotal angle by a distance equal to the length of from one-half to one and two-thirds segments, moderately serrate; the second segment nine-tenths as wide as long, three-fifths as long as and nine-tenths as wide as the third; the third segment feebly triangular, three-fifths as wide as long, eight- to nine-tenths as long as and two-thirds as wide as the fourth; the fourth segment three-fourths and the eleventh one-half as wide as long, the latter not constricted, the intermediate segments distinctly longer than wide. Female antenna failing to attain the apex of the angle by a distance equal to the length of two and one-half or three and one-half segments, the third segment a little less than three-fifths as wide as long, seven-tenths as wide as the fourth, the latter two-thirds as wide as long. Pronotal sides moderately to rather strongly arcuate, feebly sinuate before the posterior pronotal angles, the latter not or scarcely divergent, stout and not very acute; the carina situated near the outer margin of the angle. Elytral vestiture distinctly whorled. Aedeagus as figured; the lobes long and slender; the upper basal margin of each lateral lobe not strongly oblique, the base of the ventral portion of these lobes not visible from above.

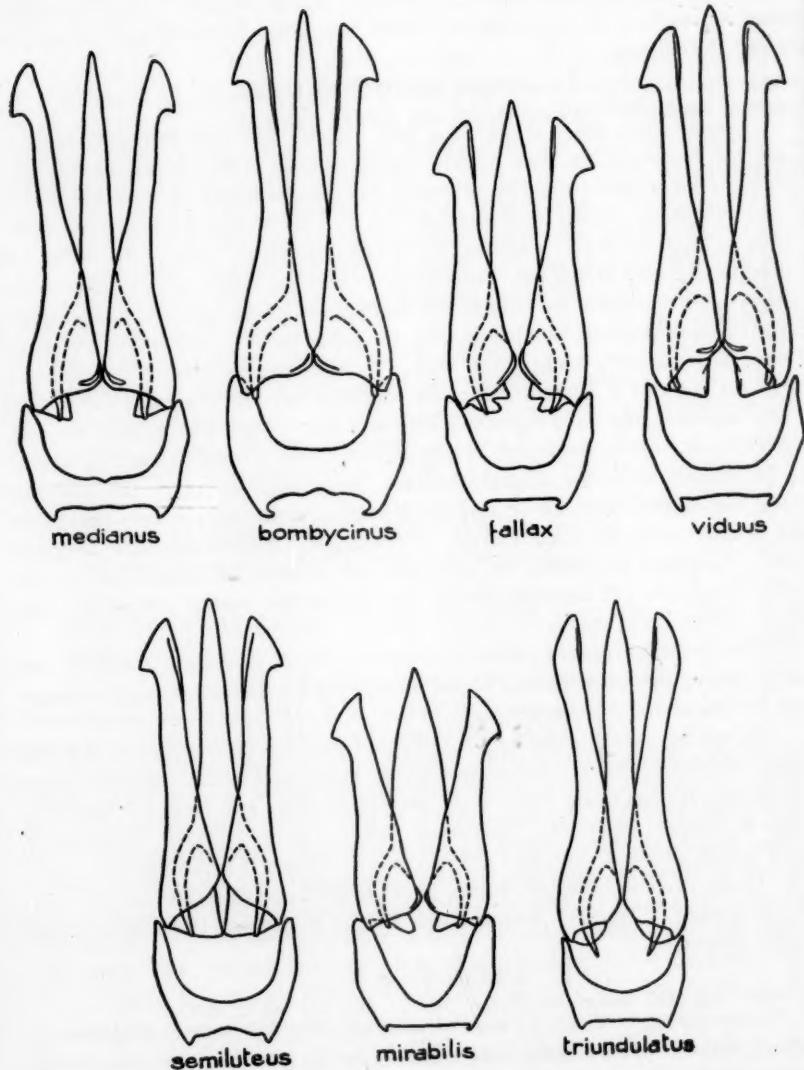
This species resembles *fallax* in color but differs from both the latter and *viduus* in having the third antennal segment more slender and less strongly triangular and by characters of the aedeagus.

The species was described from Oregon Territory. It is represented in the Leconte collection by several specimens labeled Oregon and in the collection before me by seventy-six specimens from Waterton Lakes, Alta., and from the following localities in British Columbia: Vancouver, Salmon Arm, Saanich, Similkameen River, Premier, Vernon, Nelson, Oliver, Victoria, Nicola, Pender Harbor, Goldstream, Trinity Valley, Chilcotin, Kaslo, Creston, Enderby, Quesnel, Midday Valley, Mara, Sidney, Fitzgerald, Summerland, Copper Mountain, Hope Mts., Langford, and Osoyoos.

3. *Ludius fallax* Say.

Elater fallax Say, 1839, Trans. Am. Philos. Soc. VI, 170; Lec. ed. II, 605.

Length 9.7 mm.; width 3.3 mm. Elytra and legs dull, pale reddish-brown, the femora darker. Male antenna just attaining the apex of the posterior pronotal angle, moderately serrate; the second segment equal in length and width, three-fifths as long as and nine-tenths as wide as the third; the third segment rather strongly triangular, seven-tenths as wide as long, three-fourths as long as and seven-tenths as wide as the fourth; the fourth segment three-fourths and the apical seg-

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ment two-fifths as wide as long, the latter not constricted; the intermediate segments distinctly longer than wide. Pronotal sides moderately arcuate, feebly sinuate before the posterior angles, the latter feebly divergent, stout; the carina dividing the angle into two subequal parts, distant from the outer margin of the angle. Vestiture distinctly whorled before and behind the middle of each elytron. Aedeagus as figured, the lobes short and stout.

The above description is based on a single specimen from New Hampshire, the type locality. In this specimen and in several from the same state in the Blanchard collection, the third antennal segment is stouter and more strongly triangular than in *bombycinus*, the specimens agreeing in this respect with *viduus*. The carina of each posterior pronotal angle is more distant from the outer margin of the angle than in any of the other species.

I have seen a specimen of the present species, which seems to be very rare, from Lake Memphremagog, Que., and the Leconte collection contains one from Lake Superior. In the specimen before me, the punctures at the middle of the pronotum are less densely placed than in any of the examples of *viduus* and *bombycinus*, and the head is a little wider, being three-fifths as wide as the pronotum as against one-half as wide in the other two species.

4. *Ludius viduus* n. sp.

Male. Length 10.5 mm.; width 3.6 mm. Elytra and legs very dark brown, almost black, the tarsi slightly paler. Antenna failing to attain the apex of the posterior pronotal angle by a distance equal to one-third the length of the apical segment, moderately serrate; the second segment nine-tenths as wide as long, three-fifths as long as and four-fifths as wide as the third; the third segment rather strongly triangular, two-thirds as wide as long, four-fifths as long as and seven-tenths as wide as the fourth; the fourth segment four-fifths and the eleventh one-half as wide as long, the latter not constricted; the intermediate segments distinctly longer than wide. Pronotal sides moderately arcuate, feebly sinuate before the posterior angles, the latter broad and not very acute; the carina of each angle near the outer margin. Each elytron with a distinct whorl in the vestiture before and behind the middle. Aedeagus as figured, the lobes long and slender; as in *bombycinus* but with the upper basal margin of each lateral lobe more strongly oblique, the lower basal portion broadly exposed and visible from above.

Female. Antenna failing to attain the apex of the posterior pronotal angle by a distance equal to the length of three and one-half segments, the third and fourth segments slightly more slender than in the male as in *bombycinus*; the third segment three-fifths as wide as long, four-fifths as wide as the fourth, the latter three-fifths as wide as long.

Holotype.—♂, Summerland, B. C., May 13, 1933, (A. N. Gartrell); No. 3884 in the Canadian National Collection, Ottawa.

Allotype.—♀, same data.

Paratypes.—5, same data; 9, Vernon, B. C., various dates from March to June, (Ralph Hopping, I. J. Ward, P. Venables); 1, Penticton, B. C., June 5, 1933, (A. N. Gartrell); 1, Creston, B. C., May 17, 1926, (A. A. Dennys); 2, Nicola, B. C., April 30 and June 1, 1922, (P. N. Vroom); 1, Yale, B. C., May 17, 1919, (W. B. Anderson); 1, Midday Valley, B. C., June 5, 1921; 2, Chilcotin, B. C., May 30,

1921, (E. R. Buckell); 1, Vancouver, B. C., April 25, 1915, (R. H. Chrystal); 1, Okanagan Centre, B. C., May 9, 1929, (A. A. Dennys); 1, Kaslo, B. C., May 19, 1926 (A. A. Dennys).

The paratypes measure from 9.6 to 12.7 mm. The species occurs with *bombycinus* but differs from it constantly in the color of the elytra, the stouter third antennal segment, and in the form of the basal part of the lateral lobes of the aedeagus, neither species showing much variation in these characters.

5. *Ludius semiluteus* Lec.

Corymbites semiluteus Lec., 1853, Trans. Am. Philos. Soc. X, 445.

Length 10.2-11.2 mm.; width 3-3.3 mm. Elytra and legs dull, pale reddish-brown, the femora darker. Male antenna just attaining the apex of the posterior pronotal angle; strongly serrate; the intermediate segments distinctly longer than wide, with their outer angles more acute than in any of the other species; the second segment slightly transverse, nine-tenths as long as wide, one-third as long as and three-fifths as wide as the third; the third segment strongly triangular, larger than in any other species, seven-tenths as wide as long, equal in length to and three-fourths as wide as the fourth; the fourth segment nine-tenths and the eleventh one-half as wide as long, the latter distinctly constricted. Female antenna failing to attain the angle by a distance equal to the length of two segments, the third and fourth segments more elongate than in the male; the third segment three-fifths as wide as long, four-fifths as wide as the fourth, the latter seven-tenths as wide as long. Pronotum with the sides moderately arcuate, scarcely sinuate before the posterior angles, the latter scarcely divergent, broad and not very acute; the carina of each angle situated near the outer margin. Elytral vestiture more conspicuously whorled than in any other species except *mirabilis*. Aedeagus as figured, the lobes moderately elongate.

The species is strongly defined by the characters of the antennae, vestiture, and aedeagus. The type specimen is a denuded male from California. I have three specimens from Tamarac Lake, Calif., 8,000 ft.

6. *Ludius mirabilis* Fall.

Corymbites mirabilis Fall., 1901, Trans. Am. Ent. Soc. XXVII, 306.

Length 8.4 mm.; width 3.2 mm. Elytra dull reddish-yellow; legs black, the tarsi paler. Male antenna failing to attain the apex of the posterior pronotal angle by a distance equal to half the length of the apical segment, moderately serrate, the intermediate segments as wide as long; the second segment equal in length and width, three-fifths as long as and nine-tenths as wide as the third; the third segment moderately triangular, three-fifths as wide as long, five-sixth as long as and seven-tenths as wide as the fourth; the fourth segment three-fourths and the eleventh a trifle more than one-half as wide as long, the latter not constricted. Head and pronotum almost concealed by the vestiture, this very strongly and conspicuously whorled on the pronotum; the pronotal sides strongly and evenly arcuate, strongly sinuate before the posterior angles; the latter strongly divergent, rather slender and very acute, the carina of each situated near the outer margin. Elytral vestiture more conspicuously whorled than in any other species. Aedeagus as figured, the lobes very short and stout.

This is the most strongly characterized species of the present group. The above description is based on a single male from Sequoia National Park, Calif. The type is a female from Kaweah, Tulare Co., Calif.; it is a little larger than my specimen.

triundulatus group.

Here are included three species, *triundulatus* Rand., *nebraskensis* Bland, and *tigrinus* Fall. They may be known by their pale brown elytra which are marked by three transverse, dark bands. They have the pronotum very finely and closely punctate and the propleura not emarginate at base, this being a combination of characters shared only by the species of the *fallax* group in which the prosternal sutures are excavated anteriorly. The species have been discussed recently by Dr. Van Dyke (1932, Proc. Cal. Ac. Sci. 4th ser., XX, 434) who has, like some previous authors, subordinated *nebraskensis* and *tigrinus* to *triundulatus*. For reasons given below, I believe all three are entitled to specific rank. The species possess the following characters in common.

Body three times as long as wide or a trifle more elongate; depressed and only feebly convex; black, the antennae and legs frequently brown; elytra pale brown, each elytron with three transverse bands darker brown; the median band situated at the middle of the elytron, narrow and angulate, the angle directed anteriorly; the basal band situated midway between the base and median band, similar to the latter but sometimes less strongly angulate; the apical band midway between the median band and the apex, usually a little wider, subquadrate or arcuate. Vestiture very distinct, fine and silvery, black near the scutellum and on the transverse bands of the elytra and sometimes forming black spots on the pronotum; this vestiture with sparsely intermixed coarser hairs, these suberect, directed anteriorly on the pronotum. Antenna not strongly serrate; the segments elongate; the second segment distinctly longer than wide, equal in width to the third, the latter scarcely triangular; the fifth segment eight- or nine-tenths as long as the fourth; the eleventh somewhat variable but about two-fifths as wide as long. Head from three-fifths to two-thirds as wide as the pronotum, finely and very closely punctate; the front flattened. Pronotum with the length and width equal or a trifle wider than long; the sides evenly and moderately to rather strongly arcuate; disk very finely and very closely punctate, the punctures not coarser and not or scarcely closer on the sides, not confluent; the posterior angles very short but moderately acute, the carinae not or scarcely evident. Elytra a trifle wider at apical two-fifths; the striae fine, distinctly impressed and punctate; intervals feebly convex, very finely and closely but not very distinctly punctulate. Prosternal sutures not excavated. Basal margin of propleuron truncate or even feebly arcuate, not emarginate near the prothoracic angle. Venter finely and very closely punctate; the punctures of the propleura a little less fine, confluent. Females often larger and a trifle stouter than males.

KEY TO SPECIES

1. Antenna with the third segment two-thirds as long as the fifth; the second and third segments united equal in length to the fourth in the male, a trifle longer than the fourth in the female. Length less than 9 mm. Occurring from N. B. to B. C. 1. *triundulatus* Rand.
Antenna with segments three and five equal in length, the second and third

segments united distinctly longer than the fourth. Length 9 mm. or more. Species of the Rocky Mountain and Pacific regions 2.

2. Pronotum with two rounded spots of black pubescence on each side. Antennal segments slightly less elongate. California 3. *trigrinus* Fall. Pronotum sometimes with one rounded spot of dark pubescence on each side, the spots rarely distinct and usually not evident. Antennal segments slightly more slender. Montana, British Columbia 2. *nebraskensis* Bland.

1. *Ludius triundulatus* Rand.

Elater triundulatus Rand., 1838, Bost. Jour. Nat. Hist. II, 12.

Length 6.3-8.8 mm.; width 2-2.9 mm. Antenna surpassing the apex of the posterior pronotal angle by a distance equal to the length of two and one-half segments in the male, by a distance equal to or a little less than the length of the apical segment in the female; the second segment three-fourths as long as the third; the third segment three-fifths or two-thirds as wide as long, three-fifths as long as and three-fifths as wide as the fourth in the male, two-thirds as long as and two-thirds as wide as the fourth in the female; the intermediate segments more elongate in the male than in the female, the tenth segment three-fifths as wide as long in the male, two-thirds as wide as long in the female. Pronotum sometimes with a circular spot of dark hairs on each side near middle, this only rarely distinct and usually not evident. Aedeagus as figured.

The species was described from Moosehead Lake, Maine; it is very abundant. The large series before me contains specimens from the following localities: Mt. Washington, N. H.; Kentville, N. S.; Boiestown and Bathurst, N. B.; Cascapedia, Gaspe Co., Mutton Bay, Thunder River, Abitibi District, Kazubazua, and Knowlton, Que.; Ottawa, Sudbury, Go Home Bay, Smoky Falls, Biscotasing, and Hymers, Ont.; Aweme and Onah, Man.; Trinity Valley, Vernon, and Salmon Arm, B. C.

2. *Ludius nebraskensis* Bland.

Corymbites nebraskensis Bland, 1863, Proc. Ent. Soc. Phila. I, 355.

Length 9-11 mm.; width 3-3.7 mm. Antenna surpassing the apex of the posterior angle by a distance equal to the length of the apical segment in the male, just attaining the apex in the female; the second segment half to three-fifths as long as the third; the third segment two-fifths as wide as long, eight- or nine-tenths as long as and seven-tenths as wide as the fourth; the intermediate segments not more elongate in the male, the tenth segment three-fifths as wide as long or a trifle more elongate. Pronotum sometimes with a circular spot of dark hairs on each side, the spots as in *trigrinus*, rarely distinct and often not evident. Aedeagus as in *trigrinus*, the lobes a trifle more slender than in *triundulatus*.

In this species, the antennae vary sexually only in being a trifle more elongate in the male. The species was considered synonymous with *triundulatus* by Horn (1871, Trans. Am. Ent. Soc. III, 322), and Dr. Van Dyke seems to consider it a variant of the same species. The type specimen of *nebraskensis* is a female, measuring 9 mm., taken near Fort Benton, Montana. It is badly bleached and in very poor condition, but the antennal characters show it to be conspecific with the specimens described above. That *triundulatus* and *nebraskensis* are speci-

fically distinct is shown by numerous specimens of both from Vernon and Salmon Arm, B. C.; these specimens show no evidence of intergradation. Of the present species I have twenty-nine specimens from the following localities in British Columbia: Oliver, Vernon, Anderson Lake, Midday Valley, Rockcreek, Pender Harbor, Indian Meadows, Voght Valley and Salmon Arm.

3. *Ludius trigrinus* Fall.

Corymbites trigrinus Fall, 1901, Trans. Am. Ent. Soc. XXVII, 306.

Length 9-11.2 mm.; width 3.3-8 mm. Antenna surpassing the apex of the posterior pronotal angle by a distance equal to half or three-fourths the length of the apical segment in the male, just attaining the angle in the female; the second segment three-fifths or two-thirds as long as the third; the third segment two-fifths or one-half as wide as long, eight- or nine-tenths as long as the fourth, seven-tenths as wide as the fourth in the male, three-fourths or four-fifths as wide in the female; the intermediate segments a little more elongate in the male than in the female; the tenth segment two-thirds as wide as long in the male, seven-tenths or three-fourths as wide as long in the female. Pronotum with two rounded spots of black pubescence on each side; the anterior spot larger and near middle, the posterior spot on the basal declivity; the spots always quite distinct in perfect specimens. Aedeagus as in *nebraskensis*, the lobes slightly more slender than in *triundulatus*.

This species differs from *nebraskensis* only in feeble but constant characters of the antennae and in the nature of the spots of the pronotal vestiture. It has been considered as probably a slight variant of *triundulatus* by Mr. Fall (1907, Ent. News, XVIII, 176) and was placed as a subspecies of *triundulatus* by Dr. Van Dyke.

In view of the characters and distribution of the three forms, it seems very improbable that *tigrinus* is so closely allied to *triundulatus*. The closest ally of the former is *nebraskensis* which is certainly specifically distinct from *triundulatus*; future studies may show that *tigrinus* is only subspecifically distinct from *nebraskensis*.

CAPITOPHORUS APHIDS INFESTING CHRYSOTHAMNUS¹.

BY G. F. KNOWLTON AND C. F. SMITH,²

Logan, Utah.

In view of the abundance, wide distribution, and forage value of some of the rabbit brush species in western North America and the lack of knowledge concerning the range entomology of this region, it was felt that a study of the *Capitophorus* aphid fauna of this plant would be desirable.

KEY TO APTERA

- A. Distal half of cornicles dark
- B. Cauda bearing 3 or more pairs of lateral hairs
 - C. Dorsal tubercles large and prominent; antennal IV—usually longer than III *gregarius*

1.—Contribution from the Entomology Department, Utah Agricultural Experiment Station.

2.—Associate Entomologist and Research Assistant, respectively. Authorized for publication, February 15, 1936.

- CC. Dorsal tubercles small and inconspicuous; antennal IV—shorter than III *xerozoous* n. sp.
- BB. Cauda bearing only two pairs of lateral hairs
 - C. Hairs long and conspicuous on vertex and antennal III *acanthovillus* n. sp.
 - CC. Hairs on vertex and antennal III short and inconspicuous
 - D. Cauda with one small flattened dorsal hair *utensus*
 - DD. Cauda with 2 or 3 short blunt hairs on dorsal and dorso-lateral surface *magnautensus* n. sp.
- AA. Distal half of cornicles pale (may be dusky toward apex)
 - B. Cauda bearing 3 or more pairs of lateral hairs
 - C. Cauda with flattened hairs on dorsal surface *oestlundi*
 - CC. Cauda bearing only pointed hairs on dorsal surface
 - *chlorophainus* n. sp.
 - BB. Cauda bearing but 2 pairs of lateral hairs
 - C. Anal plate rather flat cross the end, slightly indented *elongatus*
 - CC. Anal plate not indented, apex obtusely pointed or rounded
 - D. Antennal III more than 0.75 mm. long *chlorophainus* n. sp.
 - DD. Antennal III less than 0.75 mm. long.
 - E. Abdomen densely haired
 - F. Cornicles cylindrical *wasatchii*
 - FF. Cornicles more or less clavate near apex *palmerae*
 - EE. Abdomen not densely haired
 - F. Base of antennal VI longer than hind tarsi *feragaeus* n. sp.
 - FF. Base of antennal VI not noticeably longer than hind tarsi
 - *pycnorhysus* n. sp.

***Capitophorus acanthovillus* n. sp.**

Apterous vivipara.—Body green, 1.69 to 1.9 mm. long and pear-shaped; hairs on vertex 0.024 to 0.03 mm. long; antennal III, 0.53 to 0.69 mm. long and bearing 1 to 4 sensoria; IV, 0.37 to 0.53; V, 0.3 to 0.42; VI, 0.09 to 0.13 + 0.47 to 0.63 mm.; rostrum attaining second coxae, tip slenderly obtuse, segments IV + V 0.09 mm. long; cornicles black, 0.27 to 0.58 mm.; cauda pale 0.25 to 0.3; hind tibiae 1.07 to 1.28 mm.; hind tarsi 0.11 to 0.14 mm. long and armed with long hairs enlarged at apex.

Alate vivipara.—Body 1.41 mm. long; hairs on vertex knobbed or flattened, 0.02 mm. long; antennal III, 0.6 mm. long with 5 to 9 sensoria; IV, 0.44; V, 0.34 to 0.39; VI 0.094 to 0.11 + 0.47 to 0.55 mm. long; rostral IV + V, 0.094; cornicles 0.28 to 0.31; cauda pale, 0.2 to 0.3; hind tibiae 1.09; hind tarsi 0.11 to 0.12 mm. long.

Collections.—Collected upon *Chrysothamnus* at Curlew Valley, Utah, June 9, 1930; on *Chrysothamnus viscidiflorus* at Holmes Creek, Rich County, Utah, July 5, 1935; and on *Gutierrezia* at Cedar Springs and Curlew Valley, June 9, 1930 (Knowlton).

Taxonomy.—This species might be placed in the genus *Macrosiphum* by some writers, as it is one of the intermediate forms. *Capitophorus acanthovillus* differs from *Macrosiphum packi* Knlt. in being smaller, more robust, having

shorter appendages, and in having fewer hairs upon the cauda. From *Capitophorus gregarius* in having but two pairs of lateral hairs on the cauda in the aptera, more pointed anal plate, fewer body hairs, not having conspicuous dorsal tubercles, having the antennae longer than the body, and possessing knobbed hairs upon the vertex. It differs from *C. utensus* in having longer and more knob-like hairs upon the vertex and antennae, lighter colored antennae, and more conspicuous hairs upon the body.

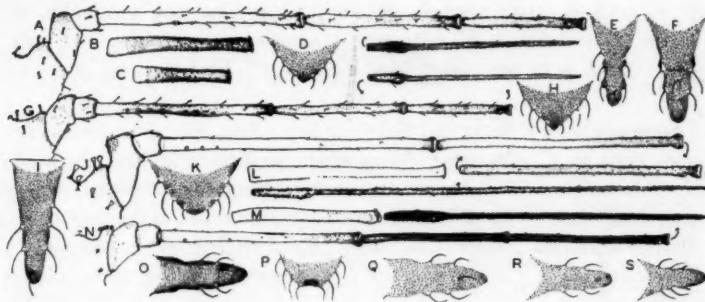


Fig. 1.—*Capitophorus acanthovillus* n. sp. Apterous, A, B, D, F. alate C, E, G, H. *C. chlorophainus* n. sp. Apterous, I to L. *C. feragaeus* n. sp. Apterous, M. to O. *C. elongatus* Knlt. Apterous, P, Q. *C. utensus* P. and K. Apterous, R; alate, S.

Capitophorus chlorophainus n. sp.

Apterous vivipara.—Color shiny apple-green; body 1.9 to 2.4 mm. long; antennae dusky, becoming darker beyond middle of IV; antennal III, 0.83 to 0.94 mm. long with 1 to 3 sensoria; IV, 0.81 to 0.94; V, 0.72 to 0.8; VI, 0.17 to 0.2 + 1.27 to 1.41 mm.; hairs on vertex 0.034 to 0.038 mm.; rostrum slenderly obtuse, attaining second coxae, IV + V, 0.09 to 0.01 mm. long; cornicles pale, 0.61 to 0.72 mm.; cauda pale, 0.37 to 0.42 mm. (total length); hind tibiae 1.72 to 1.96; hind tarsi 0.14 to 0.16 mm.

Collections.—Upon *Chrysothamnus viscidiflorus* in Logan Canyon, Cache County, Utah, August 16, 1927 (Knowlton). A very active species.

Taxonomy.—*Capitophorus chlorophainus* differs: From *Capitophorus elongatus* in having a more densely and uniformly haired body and in lacking the slight inflation just preceding the flange on the cornicles, having a rounding point on anal plate and longer hairs on vertex and abdomen; from *C. longinectarius* G. and P. in having rostrum not needlelike, blunt instead of flattened hairs on antennal I and II, longer cauda and shorter rostral IV + V; and from *C. wasatchii* in having antennal III and cornicles more elongate.

Capitophorus elongatus Knlt.

Canadian Ent. 61: 11, 1929.

This slender green aphid has been collected upon *Chrysothamnus parryi* and occasionally upon *C. viscidiflorus* and *C. nauseosus*. Collections have been made at Alton, June 26, 1927; Anabella; Black Ridge in Beaver County; Cedar Fort; Circleville; Enterprise; Fruitland; Glendale; Junction; Marysville; Milford; Nioche; Panguitch; Richfield; Santaquin; Sevier; Spry; Torry; and other parts

of Utah. One collection was made upon *C. viscidiflorus* at Linland, Colorado, August 18, 1935 (Knowlton).

Capitophorus feragaeus n. sp.

Apterous vivipara.—Body robust, 1.79 to 2 mm. long, moderately covered with fan-like hairs 0.014 to 0.017 mm. long on abdomen and 0.027 on vertex; antennae black beyond distal end of III with balance of antennal III dusky; antennal III 0.67 to 0.71 mm. long with 1 to 2 sensoria; IV, 0.59 to 0.63; V, 0.51 to 0.57; VI, 0.157 to 0.18 + 0.94; rostrum slenderly obtuse but not needlelike, attaining second coxae, rostral IV + V, 0.94 mm.; cornicles pale, 0.48 to 0.51 mm. long; cauda pale, 0.29 to 0.33 mm. long; hind tibiae 1.08; hind tarsi 0.127 to 0.14 mm. long.

Taxonomy.—In Gillette and Palmer's key (Ann. Ent. Soc. Amer. 27: 145), this species runs to *C. elongatus*, from which it differs in having antennal IV noticeably shorter than III, shorter antennal V, anal plate without a depression and shorter body hairs. It differs from *C. pycnorhynsus* in having base of VI longer, shorter cornicles, longer hind tibiae and shorter hairs on body and vertex.

Collections.—On *Chrysothamnus nauseosus* at McCoy, Colorado, August 24, 1935 (Knowlton).

Capitophorus gregarius Knlt.

Canadian Entomologist 61: 13, 1929.

Sometimes excessively abundant upon *Chrysothamnus nauseosus*. Collected at Garland; Green River; July 25, 1935; Logan Canyon; Milford; Snowville, May 17, 1928; Tremonton; Wanship, July 15, 1925; Willard; Laketown, August 16, 1927, upon *C. viscidiflorus* in Utah (Knowlton). Also collected in Idaho at Battle Creek, June 9, 1935; Emigration Canyon; Stone, upon *C. nauseosus* (Knowlton).

Capitophorus magnautensus n. sp.

Apterous vivipara.—Color green, 2.35 to 2.6 mm. long (to base of cauda) and 1.35 to 1.62 mm. wide across abdomen; body sparsely covered with inconspicuous blunt to flattened hairs; antennae dusky to blackish; antennal III, 0.8 to 0.87 mm. with 1 to 5 sensoria; IV, 0.66 to 0.74; V, 0.5 to 0.58; VI, 0.11 to 0.13 + 1.05 mm.; rostrum reaching second coxae; rostral IV + V, 0.08 to 0.095 mm. long, obtuse at apex; hind tibiae 1.67 to 2.02; hind tarsi 0.16 to 0.17; cornicles black, 0.39 to 0.47; cauda pale, 0.37 to 0.42 mm. long.

Collections.—Uintah Basin; upon *Chrysothamnus viscidiflorus* at Fort Duchesne, Utah, July 14, 1927 (Knowlton).

Taxonomy.—This species very much resembles *C. utensis*, from which it differs in being much larger and in having more than one dorsal hair upon the cauda.

Capitophorus oestlundii Knlt.

Canadian Ent. 59: 235, 1927.

This green, rather pulverulent aphid has been most commonly collected upon *Chrysothamnus nauseosus* in Utah, Idaho, Wyoming, and Nevada. It has less frequently been collected upon *C. parryi* and *C. viscidiflorus*. Collected at Antimony; Beaver; Belnap; Cedar; Cedar City; Cedar Valley; Circleville; Cisco;

Collinston; Curlew Valley; Dunbar; Elsinore; Emery; Escalante; Fillmore; Fisher's Pass; Floy; Fountain Green; Fruitland; Genola; Grouse Creek; Hardup; Honeyville; Huntington; Huntsville; Iosepa; Kanab; Kanosh; Leeds; Logan Canyon; Losee; Nephi; Newton; Park Valley; Red Canyon; Santa Clara; Saint George; Scipio; Sigurd; Summit; Tremonton; Tropic, September 19, 1935; Wild Cat Creek in Beaver County; Woodruff; Woodside in Utah (Knowlton). In Colorado at Elk Springs August 18, 1935; State Bridge and Wolcott, August 24, 1935, upon *C. nauseosus* (Knowlton). In Idaho at Riverdale, May 26, 1935; Rexburg, June 22, 1935 (Smith); Battle Creek, June 9, 1935; Stone, May 17, 1928 (Knowlton). In Nevada upon *C. nauseosus* at Elko, June 16, 1934; Loveland, June 24, 1934 (Knowlton). In Wyoming at Evanston, Fort Bridger, and Lyman, August 4, 1932 (Knowlton).

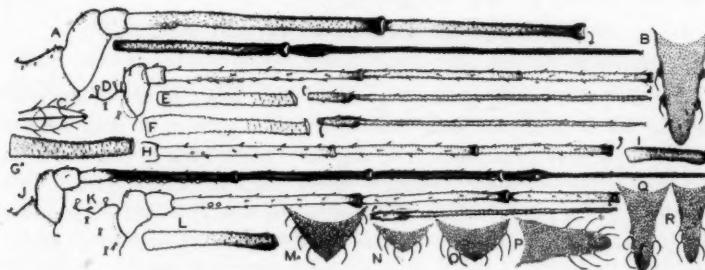


Fig. 2.—*Capitophorus magnautensis* n. sp. Apterous, A, B, G. *C. pycnorhysus* n. sp. Alate, D, E, N, R; apterous C, F, H, M, Q. *C. utensis* n. sp. Alate, I, J. *C. xerozoous* n. sp. Apterous, K, L, O, P.

Capitophorus palmerae Knlt.

Ann. Ent. Soc. Amer. 28: 282, 1935.

Apterae taken upon *Chrysothamnus nauseosus* in Tahoe National Forest, California, June 17, 1934 (Knowlton).

Capitophorus pycnorhysus n. sp.

Apterous vivipara.—Color pale to apple green, somewhat shiny; body pyriform, 1.6 to 2.2 mm. long and moderately clothed with fan-shaped to finger-like hairs; antennal III, 0.5 to 0.72 mm. long with 1 to 4 sensoria; IV, 0.43 to 0.61; V, 0.39 to 0.55; VI, 0.1 to 0.14 (usually 0.12) + 0.62 to 0.91 mm.; rostrum slenderly obtuse, reaching second coxae, IV + V, 0.09; hind tibiae, 1.24 to 1.5; hind tarsi 0.12 to 0.14 mm.; cornicles pale, 0.53 to 0.66 mm.; cauda pale, 0.21 to 0.3 mm. long.

Alate vivipara.—Body 1.25 mm. long; hairs on vertex 0.034; body hairs 0.02 to 0.026 mm.; antennal III, 0.65 to 0.72 mm. long with 5 to 10 sensoria in a row; IV, 0.52 to 0.55; V, 0.42 to 0.5; VI, 0.12 to 0.14 + 0.96; wing veins conspicuous, dusky; hind tibiae 1.25 to 1.27; hind tarsi 0.11 to 0.13 mm. long; rostral IV + V, 0.08 to 0.09; cornicles pale, 0.45 to 0.58; cauda pale, 0.25 mm. long.

Collections.—Aptera upon *Chrysothamnus viscidiflorus* in the Smithfield, Trenton, Amalga Area of Cache County, Utah, July 2, 1927 (Knowlton); Providence, August 25, 1925; Amalga, August 9, 1927; Laketown, August 16, 1927;

Holmes Creek in Rich County, July 5, 1935; Curlew Valley, June 9, 1930; Nioche, June 28, 1927; Blue Flats in Uintah Basin, July 15, 1927; in Utah (Knowlton). Alates and apterous forms were also collected upon *Gutierrezia* at Cedar Spring and Curlew Valley, Utah, June 9, 1930 (Knowlton). Also in Emigration Canyon, August 16, 1927 and at Dayton, June 21, 1935, in Idaho (Knowlton). One collection was made upon *Artemisia* in Cottonwood Canyon, Utah, August 21, 1925 (Knowlton).

Taxonomy.—This species runs to *Capitophorus wasatchii* in Gillette and Palmer's key (Ann. Ent. Soc. Amer. 27: 145), from which it differs in having a double row of dorsal tubercles on the back of the abdomen and relatively few fan-shaped hairs over the abdomen. It differs from *C. elongatus* in having a shorter, broader body, more nearly cylindrical cornicles, shorter antennal segments, and an obtusely pointed anal plate.

***Capitophorus utensus* Pack and Knlt.**

Canadian Ent. 61: 201, 1929.

Alate vivipara.—Body green, 1.55 to 1.7 mm. long; vertex broadly U-shaped; antennae 2.2 to 2.62 mm. long; antennal III, 0.53 to 0.61 mm. long with 6 to 14 sensoria (largely in a row); IV, 0.47 to 0.55; V, 0.4 to 0.47; VI, 0.12 + 0.55 to 0.15 + 0.66 mm. long; rostrum barely reaching second coxae, IV + V obtuse, 0.08 mm. long; wing venation normal, veins dusky, cubitus most prominent and slightly dusky along margin; cornicles black, 0.27 to 0.3 mm. long; cauda pale.

Winged specimens taken ten miles west of Snowville, Utah, in Curlew Valley, June 7, 1930 (Knowlton). Aptera collected upon *Chrysanthemum viscidiflorus* at Bryce Canyon and Panguitch, Utah, July 29, 1928; Grouse Creek, August 13, 1932; Snowville, June 9, 1930 (Knowlton). This species was originally described from specimens taken upon *Gutierrezia* at Loa, Utah, June 26, 1926.

***Capitophorus wasatchii* Knlt.**

Canadian Ent. 59: 238, 1927.

Upon *Chrysanthemum naescosus* at Amalga, September 1, 1925; Honeyville; Madsen, September 12, 1925; Colorado material, examined through the courtesy of Professor M. A. Palmer, was in part typical of the Utah material, the balance having more of the antennae dusky to black. This condition varied with collections from the same host plants, thereby appearing to fall within the variation of this species.

***Capitophorus xerozoous* n. sp.**

Apterous vivipara.—Color green; body 1.72 to 2.35 mm. long and robust pear-shaped; hairs on vertex 0.03 to 0.034 mm.; antennae dusky to black beyond middle of V (occasionally beyond middle of IV); antennal III, 0.5 to 0.66 mm. long with 1 to 2 sensoria; IV, 0.39 to 0.52; V, 0.36 to 0.51; VI, 0.11 to 0.14 + 0.42 to 0.8 mm. long; rostrum attaining second coxae, tip slenderly obtuse (not needlelike), IV + V, 0.08 to 0.09 mm.; cornicles dusky on distal half, 0.31 to 0.42; cauda pale, 0.22 to 0.31 mm.; hind tibiae 0.83 to 1.09; hind tarsi 0.12 to 0.14 mm.; hairs moderately abundant upon thorax and anterior portion of abdomen, being less abundant over caudal two thirds of abdomen.

Collections.—Upon *Chrysanthamus parryi* at Milford, September 22, 1928; on *Chrysanthamus* at Tremonton, Utah, September 4, 1925 (Knowlton). Specimens which vary but slightly from the Milford series were collected upon *Chrysanthamus nauseasus* at Stone, Idaho, May 17, 1928 (Knowlton).

Taxonomy.—In Gillette and Palmer's key (Ann. Ent. Soc. America, 27: 145), this species runs to *C. gregarius*, from which it varies in having antennal IV noticeably shorter than III, shorter and paler cornicles, fewer hairs upon the abdomen, and much less conspicuous dorsal tubercles.

A NEW RACE OF GLAUCOPSYCHE LYGDAMUS FROM THE WHITE MOUNTAINS, ARIZ. (LEPID., LYCAENIDAE).*

BY J. McDUNNOUGH,

Ottawa, Ont.

Glaucoopsyche lygdamus arizonensis var. nov.

Male. Characterized by the broad black outer border on the upper-side of both wings, this border being frequently 2 mm. in width. The blue color on the remaining wing-area is very deep, and, although quite shiny in certain lights, is more the color of *P. icarioides*, and much darker than in the other western races. On the underside the black spots are very large, and prominently white-ringed; the ground color is a deep gray-brown, rather reminiscent of the type form and darker than is usual in the Coloradan *oro* Scud. Fringes white.

Female. Upper side deep blackish with white fringes and a considerable sprinkling of deep blue scales in the basal area of both wings. Underside as in male. Expanse 26-30 mm.

Holotype.—♂, White Mts., Ariz., May 27, 1934, No. 4089 in the Canadian National Collection, Ottawa.

Allotype.—♀, Coulter, White Mts., Ariz., June 20, 1935, in the Canadian National Collection, Ottawa.

Paratypes.—5♂, same data as Holotype; 1♂, White Mts., Ariz., June 25, 1935, 1♂, same data as Allotype; 1♂, Greer, White Mts., Ariz., June 26, 1935; 2♀, same data as Allotype, June 19, 1935; 1♀, White Mts., Ariz., June 25, 1935.

The type series was received through the courtesy of those enthusiastic collectors, Mr. and Mrs. J. L. Sperry, the specimens being taken at various localities in the White Mountains at an altitude of about 9,000 ft. Apparently this striking race is by no means common. Most of the Paratypes are being returned to Mr. and Mrs. Sperry who will probably distribute them to various museums with their accustomed generosity.

NOTICE OF POSSIBLE SUSPENSION OF RULES OF NOMENCLATURE IN CERTAIN CASES.

Attention of the zoological profession is invited to the fact that request for the "Suspension of the Rules" has been made in the following cases, on the ground that "the strict application of the Règles will clearly result in greater confusion than uniformity." According to procedure one year's notice is hereby

*Contribution from the Division of Systematic Entomology, Entomological Branch, Department of Agriculture, Ottawa.

published, "making it possible for zoologists, particularly specialists in the group in question, to present arguments for or against the suspension under consideration."

Note A.—Suspend rules.

Note B.—Insert in Official List with the type as given in parentheses.

COELENTERATA.—*Monograptus* Geinitz, 1852 (*priodon*) ; A, B.

Retiolites Barrande, 1850 (*geinitzianus*) ; A, B.

Graptolithus Linn., 1768, to be suppressed; A.

ECHINODERMATA.—*Luidia* Forbes, 1839 (*fragilissima*) ; A, B.

NEMATODA.—*Anguina* Scopoli, 1777 (*Vibrio tritici*) to be suppressed;

A.

CRUSTACEA.—*Squilla* Fabricius, 1787 (*mantis*) ; A, B.

INSECTA.—The so-called "Erlangen List" of 1801 to be suppressed.

ORTHOPTERA.—*Locusta* Linn., 1758 (*Gryllus Locusta migratorius* Linn., 1758) ; *Phaneroptera* Serville, 1831 (*Gryllus falcatus* Poda, 1761) ; A, B.

HYMENOPTERA.—*Cimbex* Oliver, 1790 (*Tenthredo lutea* Linn., 1758) ; A, B. *Crabro* Fabricius, 1775 (*Sphex cibaria* Linn., 1767) ; A, B. *Lasius* Fabricius, 1805 (*Formica nigra* Linn., 1758) ; A, B. *Anthophora* Latreille, 1803 (*Apis pilipes* Fabr., 1775) ; A, B. *Ichneumon* Linn., 1758 (*Ichneumon extensorius* Linn., 1758) ; A, B. *Pimpla* Fabr., 1804 (*Ichneumon instigator* Fabr., 1793) ; A, B. *Ephialtes* Gravenhorst, 1829 (*Ichneumon manifestator* Linn., 1758) ; A, B. *Bracon* Fabr., 1805 (*Bracon minutator* Fabr., 1798) ; A, B. *Pompilus* Fabr., 1798 (*Pompilus pulcher* Fabr., 1798) ; A, B. *Bethylus* Latreille, 1802 (*Omalus fuscicornis* Jurine, 1807) ; A, B. *Prosopis* Jurine, 1807 (*Sphex signator* Panzer, [1798]) ; A, B. *Ceraphron* Jurine, 1807 (*Ceraphron sulcatus* Jurine, 1807) ; A, B. *Torymus* Dalman, 1820 (*Ichneumon bedeguaris* Linn., 1758) ; A, B. *Proctotrupes* Latreille, 1796 (*Proctotrupes brevipennis* Latreille, 1802) ; A, B. *Sphex* Linn., 1758 (*Sphex flavipennis* Fabr., 1793) ; A, B. *Ammophila* Kirby, 1798 (*Sphex sabulosa* Linn., 1758) ; A, B.

LEPIDOPTERA.—In interpreting the generic names assigned by Freyer in his *Neuere Beiträge zur Schmetterlingskunde* to the species there described, each species is to be regarded as having been described by Freyer as belonging to the genus cited by him at the head of each description and not to the genus with which he actually associated the specific name. For example. Freyer described, under the genus *Hipparchia* Fabricius, a species to which he gave the specific name *eriphyle*, and which he proceeded to name *Papilio eriphyle* Freyer. Freyer is to be deemed to have described this species under the name *Hipparchia eriphyle* and not under the name *Papilio eriphyle*. A.

Potamis Hubner, *Rusticus* Hubner, and *Mancipium* Hubner to be suppressed in favor of *Morpho* Fabr., *Helicopis* Fabr., and *Pontia* Fabr.; A.

LEPIDOPTERA (RHOPALOCERA).—*Euploca* Fabr., 1807 (*Papilio corus* Fabr., 1793) ; A, B. *Satyrus* Latreille, 1810 (*Papilio actaea* Esper, [1780]) ; A, B. *Argynnus* Fabr., 1807 (*Papilio paphia* Linn., 1758) ; A, B. *Vanessa* Fabr., 1807 (*Papilio atlanta* Linn., 1758) ; A, B. *Euthalia* Hubner, [1823] (*Papilio lubentina* Cramer, 1777) ; A, B. *Nymphidium* Fabr., 1807 (*Papilio caricae* Linn., 1758) ; A, B. *Colias* Fabr., 1807 (*Papilio hyale* Linn., 1758) ; A, B.

Species in parentheses are to be declared the types: *Lycaeides* Hubner, [1823] (*Papilio argyrogonomon* Bergstrasser, 1779); *A. Agriades* Hubner, [1823] (*Papilio glandon* Prunner, 1798); *A. Polyommatus* Latreille, 1804 (*Papilio icarus* Rottemburg, 1775); *A. Euchloe* Hubner, [1823] (*Euchloe ausonia* Hubner, var. *esperi* Kirby, 1871). *Princeps* Hubner, [1807] and *Orpheides* Hubner, [1823] (*Papilio demodocus* Esper, 1798). *Carcharodus* Hubner, [1823] and *Spilothyrous* Duponchel, 1835 (*Papilio fritillarius* Poda, 1761); *A.*

C. W. STILES,

Acting Secretary, International Commission on Zoological Nomenclature.

BOOK NOTICE,

F. N. Pierce and J. W. Metcalfe: The Genitalia of the Tineid Families of the British Islands, 1935.

This, the fourth volume from these authors, describing and figuring the genitalia of British Lepidoptera, follows the same concise form of the three preceding volumes, dealing with the Geometridae, Noctuidae, and Tortricidae.

More than 750 English species in about 180 genera are dealt with in the volume and the genitalia of both sexes illustrated. As in the former volumes, the figures are rather sketchy, but in the great majority they are sufficiently accurate to enable definite determination of the species. It has been an enormous task to make slides of and delineate these many minute organs, and the authors deserve much credit for the result of their painstaking work, which, more than any other work on these groups of small moths, clarifies their relations and will make possible their eventual natural classification. In the present volume such natural arrangement has not yet been accomplished, because the authors have hesitated to apply too radically their new evidence in making the obviously required changes in the present classification, based mainly on characters of the venation and the mouthparts.

Thus the absurd conglomerate family Lyonetidae has been retained, although the authors strongly protest and the family Ethmiidae is still misplaced in the Yponomeutidae, with which it has no relation. The authors have advisedly not followed Meyrick in making the Nepticulidae a superfamily, but have misplaced the family by separating it from its allies, the families Incurvariidae and Adelidae, the members of which are similarly aculeate and have one genital opening, by the insertion of the family Tineidae, whose members are nonaculeate and have two genital openings. Several other features in the classification will provoke discussion and will necessitate changes. Among these are the separation of *Acrocercops* from the Gracilariidae and the retention in one family of such widely separated groups as *Cosmopteryx* (with *Limnoecia*), *Blastodacna*, *Mompha*, and *Batrachedra*, where four families are required. But the volume itself will be the very best means of demonstrating and correcting these and other errors, inherited from earlier workers, and the Pierce-Metcalfe contribution is a most important step towards this end.

One observation (p. 15) is of particular interest to the economic entomologist, namely: "The two species included in the genus (*Platyedra* Meyrick) in no wise resemble each other in either sex." The generic name *Platyedra* has been

erroneously employed by European workers and a single American worker for the socalled "pink bollworm of cotton," but must be restricted to its genotype, *vilella* Zeller, as before suggested (Pro. Ent. Soc. Wash., v. 21, p. 94, 1919); the other European species, *malvella* Hubner, belongs with the pink bollworm, *gossypiella* Saunders, in the genus *Pectinophora*.

The nomenclature employed by Pierce-Metcalf is mainly adopted from Bainbridge Fletcher's most useful "List of generic names used in Microlepidoptera" and therefore partakes of the peculiarities of this work, caused partly by the nonrecognition of the much debated Hubner's "Tentamen." But as the genotype is cited by Pierce in each case, these unfamiliar names cause only minor inconvenience.

More serious is the too often recurring, "We have not seen the type" (genotype), which means that there is no assurance that the species included in such genera are truly congeneric with the genotypes. It would seem that representatives of most of these genotypes could have been easily obtained, certainly those of such common cosmopolitan economic species as the potato tuber moth, *Gnorimoschema operculella* Zeller, genotype of *Phthorimaea* Meyrick.

Mr. Pierce has generously retained his co-worker of the former volumes, the Rev. J. W. Metcalf, as full co-author of the present volume, which, however, is largely the result of Mr. Pierce's own painstaking, diligent labor. The reviewer had the privilege to visit "The Old Rectory" in Oundle and its genial host, amid his "maiden's blush" roses, while the preparation of this volume was under way and learned much during those memorable days (and nights) from this nestor and pioneer in the systematic study of the genitalia of Lepidoptera. The authors are to be congratulated on the completion and fine result of their sixteen years of laborious but "delightful" investigations.

AUGUST BUSCK.

RESEARCH NOTES.

THE EUROPEAN BEETLE, STAPHYLINUS GLOBULIFER FOURC., IN EASTERN CANADA.

Three specimens of *Staphylinus globulifer* Fourc. were taken on Mount Royal, Montreal, Que., during the summer of 1935. One of these specimens was submitted to Mr. H. C. Fall, of Tyngsboro, Mass., who kindly verified my determination.

The insect is black; distal joints of the antennae progressively paler; tarsi brownish; head usually wider than the thorax, quadrate-orbicular, hind angles rounded; mandibles slender, not toothed internally, finely grooved externally; prothorax densely punctured, shining, with a smooth median line; elytra and abdomen dull, pubescent; length 14-15 mm. Collected under stones and dead leaves by Bro. Jules and Bro. Hughes, Montreal.

The species is listed in Winkler's "Catalogus Coleopterorum regionis palaearticae" with *edentulus* Block and *morio* Grav. as synonyms.

GUSTAVE CHAGNON.

Université de Montréal Qué.

*by Geo M. Sturrett*NOTES ON THE "FLAT WIREWORM," *AEOLUS MELLILLUS* SAY.

This insect derives its scientific name from the appearance and colour of the adult, the name referring to its silky appearance and dark honey-yellow colour. In addition, adults are characterized by having four darker elytral spots and a dark spot of the same colour upon the thorax. The larva is distinguished from other common wireworms by its flatness, small size, softness of texture and light yellow colour. To distinguish this species from other wireworms, I have given it the name "flat wireworm."

The insect is remarkable in that so far investigators have not been able to find a male specimen in Canada. All of the thousands collected have been females. Mr. W. J. Brown, Division of Systematic Entomology, Entomological Branch, Ottawa, states that Kansas is the nearest location from which males have been collected. The question arises whether or not the species has become parthenogenetic in our territory, or will future investigations reveal the presence of males. No attempt has been made to rear the insect through its entire life-history in the laboratory and preliminary attempts to secure eggs from females brought in from the field have been unsuccessful. There is no doubt regarding the fact that the insect breeds in our territory as it is one of the commonest of our wireworms. Future work will, it is hoped, reveal the true facts regarding the sexual life of the insect.

The species has been collected in various parts of Canada, but apparently it is abundant enough to be of economic importance only in southern Ontario, west and south of London.

A very interesting fact regarding the species is that it requires only one year in which to undergo a complete life cycle, whereas the other common wireworms of the district require two, three, or more years. This fact has been determined by us as well as by other investigators.

These wireworms severely injure crops during the first year that are planted on newly ploughed sod land, whereas with the other species of wireworms, crops planted on new sod land frequently are only very slightly injured the first year, the reason, it is thought, being that the young wireworms feed the first year on the decaying roots and other organic matter; by the second season this has largely disappeared and they of necessity resort to the roots of the freshly sown crop. In the present species, damage results the first year but whether it is because the larvae are full grown or whether they do not feed upon decaying organic matter is unknown. Damage to crops also occurs in land that has been under cultivation for a number of years.

Records of damage to cultivated crops are very recent in southern Ontario, although the insect has been reported as injurious to cultivated crops in the United States as early as 1889. Our first record was in 1930 when it was found injuring tobacco at Charing Cross, Ontario. The insect is increasing in injuriousness. The important crops so far damaged have been tobacco, corn and sugar-beets, tobacco being the crop most severely damaged to date.

An ideal control measure for use against this or any other wireworm attacking tobacco would be a substance or chemical which could be applied in the water at the time the tobacco plants are set out in the field and which would

either repel or kill the larvae before they attacked the plant. Such a substance would, of course, have to be non-injurious to the plant and it would have to retain its effect over a period of three or four weeks. A search is being made for a chemical to use in this ideal control measure.

GEO. M. STIRRETT.

Dominion Entomological Laboratory, Chatham, Ontario.

NEWS AND VIEWS

At the annual meeting of the Quebec Society for the Protection of Plants, held at Macdonald College on April 15th, Dr. W. H. Brittain of Macdonald College was elected President, Prof. E. Campagna of Ste. Anne de la Pocatiere Vice-President, Dr. E. M. DuPorte of Macdonald College Secretary-Treasurer, and Mr. G. Maheux of the Quebec Department of Agriculture Assistant Secretary.

The following papers were presented during the meeting of the Entomological Section of the Society:—

President's Address—A propos d'un cinquantenaire: L'Oeuvre de Millarder
..... Omer Caron, Provincial Botanist, Quebec.

New Fumigation Equipment—Port of Montreal
..... L. S. McLaine, Entomological Branch, Ottawa.

Development in Export Trade (Plants and Plant Products)
..... W. N. Keenan, Entomological Branch, Ottawa.

Service d'Arrosage des Verges du Bas St. Laurent
..... Rosario Barabe, Dept. Agric., Quebec.

The new Parasite Laboratory at Belleville, Ont.
..... Arthur Gibson, Dom. Entomologist, Ottawa.

La Defense des Cultures dans Quebec
..... Georges Maheux, Provincial Entomologist, Quebec.

Le Charançon des Cyclamen
..... Jos. I. Beaulne, Dept. Agric., Quebec.

Development Rate of *Phyllophaga* Eggs and Larvae as related to Life-History
Rhythm G. H. Hammond, Entomological Branch, Ottawa.

Considerations sur la Quarantaine contre les Insectes nuisibles.
..... P. Lagloire, Dept. Agr., Quebec.

Some Natural Enemies of Blackflies C. R. Twinn, Macdonald College &
Entomological Branch, Ottawa.

The Foliage Colour of Varieties of Peas (*Pisum sativum* L.) in Contrast with the
Degree of Infestation by the pea aphid (*Illinoia pisi* Kalt.)
..... J. B. Maltais, Entom. Lab., Hemmingford.

Les Insectes Domestiques; avec notes sur le *Dermestes lardarius*.
..... Georges Gauthier, Dept. Agric., Quebec.

Some Remarks on Light and the Behaviour of Insects.
..... J. M. Cameron, Macdonald College.

The Influence of Soil Conditions on Infestations in Onions by the Onion Root-
maggot, *Hylemyia antiqua* Meig. A. D. Baker, Entomological Branch, Ottawa.

The guest-speaker for the evening was Professor V. C. Wynne-Edwards of McGill University who gave an illustrated address on the "Wild Life on the Atlantic Coast."

Mailed Saturday, June 6th, 1936.

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An Ideal Station for *Papilioxenandra* *stenoscelis*.

